UNIFORM REGIONAL TESTS OF SELECTED VARIETIES OF HIGH PROTEIN CROPS IN SEVEN LOCATIONS IN SOUTHEAST ASIA

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Foreword

The protein gap is one of the important food problems of the less developed countries of the world today. In Southeast Asia where the per capita income is low and the population expansion rates are high, the problem is more emphasized and perhaps threatens a greater mass of people than in any other region.

To partly solve this problem, the College of Agriculture of the University of the Philippines and the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) are pursuing a modest but highly promising project aimed at the spread and use of high protein content crops in the rural areas as well as in the urban centers. The program is on the way, with the cooperation of SEARCA member countries.

The enclosed report indicates the progress so far achieved as well as the expected activities of the Project in the next four years.

J. D. DRILON JR.
Director

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I. Project Title: UNIFORM REGIONAL TESTS OF SELECTED VARIETIES OF HIGH-PROTEIN CROPS IN SEVEN LOCATIONS IN SOUTHEAST ASIA

II. Worker

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Co-workers

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8. Mr. Tan Bun Suy, Ministry of Agriculture, Phanomphen, Khmer Republic
9. Mr. Roberto Monserrat, Direction de L'Agriculture, Vientiane, Laos
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12. Mr. Anothai Choomsai, Faculty of Agriculture,
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13. Two other participants from South Vietnam

III. Objectives of the Project

1) To assemble the most promising varieties of soybean, mungbean, peanut, cowpea, sweet potato and high-lysine corn in seven Southeast Asian countries and systematically test them in uniform yield trials in these seven countries.
2) To establish a mechanism, where it is absent, by which each country can directly utilize the results of these trials through a national program of extensive varietal testing, varietal release and seed certification and multiplication.
3) To exchange research information on factors relating to production of high-protein crops, especially on common problems pertaining to pest and disease control, plant nutrition and cultural requirements.

The concept behind the cooperative program is that Southeast Asian countries, which generally have limited resources for research, will mutually benefit from each other's research programs on crop improvement. For example, corn varieties with lysine content twice that of ordinary corn have been developed in the Philippines, Thailand and Indonesia. Varieties of soybean, mungo and cowpea which have built-in ecologic adaptation to specific seasons in a tropical climate have, likewise, been developed in the Philippines and elsewhere. Sources of varietal resistance to diseases have been identified. The cultural requirements of proteinaceous crops have been worked out. A breakthrough in the chemical control of rust, cercospora and powdery mildew of legumes in the Philippines has been achieved. Certainly, the countries which have not as yet established their own program of research on crop improvement will benefit from such a cooperative program which includes an exchange of plant materials and research information.

IV. Accomplishments to Date

1. Survey Trip to Laos and the Khmer Republic

Earlier in the initial period of the cooperative program, a two-man team composed of Dr. Ruben Villareal and Dr. Virgilio Carañgal made a survey and established contacts in Malaysia, Thailand and Indonesia from October 12 to November 5, 1970. The purpose and results of this trip were reported in the annual report for 1970-71.

This past year, the same team made a similar visit to the Khmer Republic and Laos from July 5-16, 1971. As in previous visits, the purposes of the study were: (a) to look at crop improvement programs, available research facilities, personnel and crop production problems; (b) contact and acquaint prospective participants on the nature and objectives of the project; and (c) collect selected crop varieties for the Philippine program.

Observations

The importance of corn, soybean, peanut, mung bean and sweet potato in Laos could not be ascertained because of the non-availability of statistical data. Besides, the occular survey the team conducted was confined within the 15-kilometer, government-imposed limit from Vientiane, which had only a few patches of corn and vegetable crops.

Rice was the predominant crop in the area. Interviews with the staff of the Laos Agricultural Division and USAID Mission indicated a growing interest in the production of most of the high protein crops. The team felt that any of these crops should play a major role in providing food supply for the expanding population of Vientiane and Laos in general.

The Salakhan Rice Experiment Station and the Hat Dok Keo Experiment Station were visited. Both stations are under the Loa Agriculture Division. The Hat Dok Keo station is devoted mostly to experiments in upland crops, particularly variety evaluation, spacing and fertilizer trials. The team strongly felt that the regional trials in Laos should be conducted in these stations. Another area which the team thought the trials may be conducted is where the selected pilot projects are being carried out by the USAID Mission.

The possible cooperators contacted in Laos were Mr. Oroth Choulamountry, Director of Agricultural Research and Director of Hat Dok Keo projects, Mr. Roberto Monserrat and Mr. Juanito Asuncion, both agriculture specialists of the USAID Agriculture Division.

Data obtained from Khmer Republic appear in Table 1.

Table 1. Area, production and average yield of soybean, peanut and corn in the Khmer Republic[a/]

Crop	Area	Production	Average Yield
	(Ha)	(Tons)	(Tons/ha)
Soybean	3,300	2,600	.790
Peanut	16,700	16,800	1.006
Corn	94,200	121,700	1.298

[a/] - Adapted from the report of the Khmer Republic Statistical Division, 1970-71.

Although no data were reported on mung bean and cowpea, these legumes were thought to be important in the country since they were commonly observed in the markets. In fact, sprouted mung beans seemed to be a part of several Cambodian vegetable dishes. There was also a wide range in the types of vegetables grown along the Mekong river. Noteworthy were the cabbage variety KK and KY and the long-pod stringbeans.

The Prek Thnot Station under the Ministry of Agriculture in the Khmer Republic is engaged in a cooperative project with the Israeli government. As in Laos, the experiments were mostly on variety evaluation and fertilizer trials. The station has the equipment and manpower to undertake the high-protein evaluation trials in addition to their on-going projects. The Direction of Agriculture which is located in Phanomphen has also adequate experimental areas on which to conduct most of the vegetable, legume and sweet potato trials. The soil laboratory of the Ministry of Agriculture may be depended upon for crude protein analysis of crop samples.

The cooperators contacted in the Khmer Republic were Mr. Remi Savandy, Chief, Division of Crops, Department of Agriculture and Mr. Tan Bun Suy, Deputy Director of Agriculture, Department of Agriculture.

Problems

Most of the research personnel in Laos and the Khmer Republic had an Israeli research counterpart. This observation, coupled with reliable information, indicate that both countries lack a sufficient number of trained technical personnel. The few who are trained are either saddled with too much activities or assigned to administrative responsibilities.

Besides unattended production problems owing to the lack of technical men, both countries do not have any effective means of making available a reliable supply of seeds of any of the high-protein crops or any other seed for that matter. For example, vegetable seeds in Laos are imported from Thailand which in turn the latter imports from either the United States, Japan or China.

Recommendations

a. The Agricultural Governing Board of SEARCA should reconsider its program of recruitment for graduate work in agriculture for nationals of either Laos or the Khmer Republic. It is felt that these countries need more graduates of B.S. Agriculture and, therefore, emphasis should be given to undergraduate scholarships for these countries.

b. One, or at most two, of the participants from both countries should be given opportunities to attend the meetings of workers in the cooperative program. Two delegates from Laos and the Khmer Republic were able to attend the meeting held at the Los Baños campus on April 27 to May 1, 1972.

c. The UPCA research team should assist in setting up the trials in these two countries during the initial implementation of the project.

2. Meeting of country participants at the U.P. College of Agriculture

For the first time, a joint meeting of 13 participants from the Philippines, Thailand, Malaysia, Indonesia, the Khmer Republic and Laos was held in Los Baños from April 27 to May 1, 1972. Two invited delegates from South Vietnam were unable to come.

The meeting accomplished two things.

a. Current situations in the production of legumes, corn and sweet potato including a description of research programs for each country were presented and discussed to acquaint all the participants with the developments in each country. The reports have been compiled and edited into a separate volume.

b. Procedures in conducting trials were standardized in terms of variety entries, plot size, plant population and spacing, fertilizer levels, statistical design, cultural management, data to be gathered, planting schedule and chemical analysis. The standardized procedures for conducting the trials have been compiled into another volume for distribution to all participants. The mechanics for assuring seed supply and arrangements for financial support were also discussed.

3. Seed Production

The different high-protein crops were planted in large plots in January and February, 1972 at the UPCA station mainly for further seed increase. During the summer, the crops were grown under irrigated conditions.

Very high yields were obtained especially for mungo and peanuts, Table 2. Enough seeds were produced to meet the seed requirements of the seven participating countries. Sweet potato cuttings and some seeds were handcarried by the returning participants who attended the meeting. Other seed lots have been sent by air freight. It is hoped that within this year the program shall be in full swing and that all trials shall have been grown in each country.

4. Results of High-Lysine Corn Yield Trial

The opaque-2 trial was conducted in Thailand, Indonesia Malaysia, Vietnam and the Philippines. Seeds were also sent to

Table 2. Computed yield per hectare and amount of seeds of soybean, mungo and peanut produced in summer, 1970

Crop	Yield in tons/ha	Amount of seeds produced (kg)
SOYBEAN (late group)		
	Dry beans	
1. L-114	1.71	21.52
2. Palnetto	1.03	11.44
3. Kaoshiung E.32	0.95	10.54
4. 1248 (Davros)	0.84	9.33
5. 945	0.84	9.30
SOYBEAN (early group and vegetable types)		
	Dry beans	
1. Clark-63	2.01	28.59
2. A2-5440	2.09	12.52
3. TK-5	1.81	32.79
4. Wayne	1.70	26.95
5. E.G. Special	1.60	4.87
6. L-2A	1.55	10.19
7. SL-6	1.54	22.26
8. Bragg	1.44	20.31
9. Lincoln	1.41	21.42
10. Hill	1.35	20.56
11. Bethel	1.30	8.73
MUNGO		
	Dry beans	
1. CES-87	2.28	13.67
2. Dau Mo Longkhanh	2.08	12.38
3. MG-50-10A	2.03	12.06
4. CES-55	1.90	11.41
5. Bhacti	1.79	10.61
6. CES-14	1.69	10.16
7. CES-28	1.53	9.29
8. Siwlic	0.98	11.35
9. Dau Moc Longkhanh	0.73	4.37

Table 2 (continued)

PEANUT

	Dry beans	
1. Kidang	2.51	27.64
2. Mo-ket	2.46	27.00
3. SK-38	2.41	26.42
4. F 334-33	2.35	26.17
5. Gadjah	2.22	24.46
6. CES 103 (Indang White)	1.66	17.81
7. CES 101	1.64	20.25
8. CES 102	1.55	15.58

COWPEA (Snap)[1/]

	Dry beans	
1. All Season	1.72	7.73
2. DES 6015	1.45	6.53
3. Los Baños Bush Sitao #1	1.31	5.88
4. PI 293528	1.27	5.72
5. PI 269666	1.26	5.66
6. Economic Garden #2	1.18	5.29
7. Virginia 67-3	1.11	4.98

COWPEA (dry)

	Dry beans	
1. All Season	1.63	7.31
2. Alabama Crowder	1.54	6.92
3. UPCA #5	1.47	6.64
4. Virginia 65-2	1.44	6.46
5. Virginia 67-3	1.29	5.79
6. Queen Anne	1.25	5.61
7. Virginia 59-41	1.20	5.40
8. UPCA #4	1.15	5.19
9. Blackeye	1.09	4.91

SWEET POTATO

	Tubers	
1. Jewel	31.90	Cuttings available
2. Georgia Red	27.25	" "

[1/] Pods were allowed to mature to obtain seeds for the regional trials.

Table 2 (continued)

Sweet Potato (continued)

3.	Daja #380	24.74	Cuttings available
4.	Sweet Potato 45	23.41	" "
5.	Karja #381J	18.81	" "
6.	Centennial	14.78	" "
7.	BNAS	9.40	" "

CORN

1.	Eto Blanco O_2O_2	10.33
2.	[(UPCA VAR 1 x O_2) S_1 UPCA VAR 1_2 S_1] #5	7.03
3.	Metro O_2O_2	5.14
4.	UPCA VAR 1 O_2O_2	8.67
5.	UPCA VAR 2 O_2O_2	7.10
6.	Cuba 11 J O_2O_2	8.77
7.	College Composite O_2O_2 (yellow)	2.95
8.	College Composite O_2O_2 (white)	5.99
9.	Cuba Group 1 O_2O_2	5.02
10.	Flint Composite Amarillo O_2O_2	7.13
11.	Ver 181 Ant. Group 2 O_2O_2	10.89
12.	Car mixed Composite O_2O_2	4.52
13.	Bogor Synthetic 2 O_2O_2	6.08
14.	Bogor Composite 2 O_2O_2	9.45
15.	[(Cebu WF x O_2) S_1 Cebu WF S_1 Cebu WF 2] #6	6.56

Laos but were not received. The experimental materials were tested using the randomized complete block design with 3 replications. Plot size was 5 meters in length, spaced at 75 centimeters between rows and 50 centimeters between hills with 2 plants to a hill. Fertilizer was applied at 150 kg N, 60 kg P_2O_5 and 60 kg K_2O per hectare. The nitrogenous fertilizer was applied in two doses, 100 kg at planting and 50 kg side-dressed after four weeks from planting.

The normal check variety in each trial was detasseled prior to pollen shedding to prevent contamination and its possible effects on the lysine content of the opaque entries.

The Philippines, Thailand and Malaysia submitted their data. Yields and other agronomic characters such as days to silking, plant and ear height, and reactions to pests and diseases are indicated in Table 3.

The normal check variety outyielded opaque-2 entries in the Philippines and Malaysia. In Thailand, two opaque entries, (UPCA VAR 2 O_2O_2) and (Ver 181-Ant. Gr C_2O_2) yielded higher than the normal Guatemalan variety which was used as the check. Maturity of (College Composite O_2O_2), (Ver 181-Ant. Gr 2 O_2O_2) and (Bogor Comp. 2 O_2O_2) was earlier than that of the other entries. (Bogor Comp. 2 O_2O_2) and (Metro O_2O_2) had shorter plant and ear height.

The data obtained in the Philippines and Malaysia were consistent with reports from other countries in South and Central America that high-lysine corn generally yields lower than normal corn, a fact which casts doubt on the real utility

Table 3. Grain yield and other agronomic characters of derived opaque-2 corn during the 1971-72 dry season in Malaysia, Thailand and the Philippines.

Pedigree	Varietal Origin	Grain yield (kg/ha)			Mean	Days to 75%	Moisture content	Height (cm)		Pest a/	Disease	
		Malaysia	Thailand	Philippines				Plant	Ear	Corn Borer	Helm.	Rust
			Tons/ha			Days	Percent					
Check (normal field corn)	-	4737	3339	6059	4711	51	23.8	231	122	2	1.5	1
Cer. Mixed Comp. O_2O_2	Thailand	3046	3528	5813	4125	52	24.9	232	120	2	2.0	1
Bogor Comp. 2 O_2O_2	Indonesia	2641	3683	5863	4062	51	15.1	198	89	2	2.0	1
College Comp. O_2O_2 (yellow)	Philippines	3277	2847	5449	3857	52	13.7	212	105	2	2.1	1
Flint Comp. Amar O_2O_2	Thailand	2497	3730	4989	3739	53	21.0	217	109	3	2.0	1
Cuba Gpo. 1 O_2O_2	Thailand	2813	3652	4670	3711	53	22.9	223	106	3	2.0	1
Bogor Syn. 2 O_2O_2	Indonesia	2993	3536	4368	3632	52	24.8	233	114	3	2.0	2
UPCA 2 O_2O_2	Philippines	1110	5256	3847	3404	53	22.8	219	109	3	2.6	1
UPCA 1 O_2O_2	Philippines	3184	2053	4872	3369	52	21.0	214	101	3	2.3	1
Ver 181 Ant. Gr. 2 O_2O_2	Thailand	2819	4090	3142	3330	54	14.1	204	102	2	2.5	1
Metro O_2O_2	Philippines	1868	3261	3214	2781	54	21.9	198	94	3	2.3	1
C.V. (%)		15.0	12.1	8.7								
LSD .01 (kg/ha)		918		885								
.05 (kg/ha)		719	725	645								
Checks (normal field)		Metro	Guatemala PB 5	UPCA VAR 1								

a/ - Rating scale

1 - Resistant
2 - Intermediate
3 - Susceptible

and significance of the new type of corn. However, developments in Mexico and in the Philippines show that the type of high-lysine corn, the so-called "modified" type which carries two sets of genes, "floury" and "opaque", behaves similarly in yield as the normal corn. Work in this direction is underway at the UPCA. In due time the "modified" types shall be included in the trials.

5. Results of Yield Trials of Vegetables

Sweet Potato. The trials for sweet potato in other cooperating stations have been delayed due to the difficulty in transporting the planting materials. This summer, however, the participants who attended the meeting brought home with them two pieces of root of each variety of sweet potato for propagation in their respective countries. The sweet potato trial in other cooperating stations will start sometime in October, 1972.

Cowpea. Seeds of snap and dry cowpea were brought to Laos, the Khmer Republic and Thailand during the survey trip made by the SEARCA team from the U.P. College of Agriculture. The plantings in Laos and the Khmer Republic were completely damaged by floods. Results of the trials in the Philippines and Thailand are presented in Tables 4 and 5, pages 16 and 18.

Table 4. Maturity, yield, growth habit and crude protein content of seven varieties of snap cowpea harvested at different periods of maturity in the Philippines and Thailand, 1971-72.

Variety [a]	Maturity [b]	Growth Habit	Weight of Marketable Pods			Crude Protein [c]		
			Philippines	Thailand	Average	Fresh Pods	Green Shell	Dry Beans
	Day		Ton/ha			Percent		
Los Baños Bush Sitao #1	57	Semi-determinate	10.95	5.48	8.215	2.00	6.01	17.94
Economic Garden #2	58	"	9.17	3.44	6.305	2.07	5.33	17.94
DES 6015	57	"	8.41	5.04	6.725	2.12	5.72	17.29
PI 269666	57	"	5.56	3.40	4.48	2.02	5.20	17.11
Virginia 67-3	57	Completely determinate	7.39	2.82	5.105	2.01	5.03	16.96
All season	57	Semi-determinate	9.25	2.10	5.675	2.08	5.22	16.13
PI 293528	61	"	6.09	2.18	4.135	2.10	3.89	15.73
HSD .05	0		2.11					
.01	0		2.64					
CV (%)	0		0.12					

a/ - All entries came from the Philippine breeding programs.

b/ - Refers to maturity of fresh pods; green shell and dry bean maturity is 3-4 days and 8-12 days later, respectively. Based from Philippine data.

c/ - Percent N x 5.71. Based from Philippine samples.

The trials were grown in 4-row plots, 5 meters long, spaced at 75 cm between rows and 20 cm between hills. A randomized complete block design with four replications was used. Fertilizer was applied at 30 kg N, 60 kg P_2O_5 and 30 kg K_2O per hectare.

There was a large difference in yield in marketable pods between the trials grown in Thailand and in the Philippines, Table 4. This difference has been attributed to the fact that in the Philippines, harvesting of pods was made more frequently than in Thailand. Besides, the pods were never allowed to over-mature on the plants which, if allowed, will inhibit the development of the succeeding pods. The data on crude protein at various stages of maturity clearly show that protein content increases as the legume pod matures.

Los Baños Bush Sitao #1 gave the highest fresh pod yield in the two countries, with an average of eight tons per hectare. Only Virginia 67-3 exhibited a completely determinate habit of growth.

In the case of dry bean yield, the data from the two trials were remarkably comparable, suggestive of the same degree of comparative adaptability among the entries in the two places, Table 5. UPCA #5 gave the highest average dry bean yield

Table 5. Maturity, yield, growth habit and crude protein content of nine varieties of dry cowpea planted in the Philippines and Thailand, 1971-72.

Variety [a]	Maturity	Growth Habit	Dry Bean Yield Philippines	 Thailand	 Average	Crude Protein [b]	Protein Yield [b]
	Days			Tons/ha		Percent	kg/ha/day
Alabama Crowder	75	Semi-determinate	1.64	1.61	1.62	18.74	4.10
UPCA #4	70	"	1.66	1.66	1.66	19.22	4.56
UPCA #5	70	"	1.61	2.66	2.14	18.41	4.23
Queen Anne	75	"	1.59	1.67	1.63	19.67	4.17
Virginia 65-2	67	"	1.77	1.75	1.76	19.52	5.16
Virginia 59-41	66	"	1.53	1.61	1.57	18.42	4.27
All season	70	"	1.86	2.07	1.96	18.68	4.96
Blackeye	75	"	2.0	1.06	1.53	-	-
Virginia 67-3	65	Completely determinate	1.59	1.06	1.32	18.04	4.41
HSD .05	0.9		0.46				
.01	1.1						
CV (%)	0.55		11.7				

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[a] - All entries came from the Philippine programs.

[b] - Percent N x 5.71. Based on results from Philippine samples.

which was as high as 2.66 tons to a hectare in Thailand. When yield was converted in terms of kg per hectare per day, Virginia 65-2 was the most productive on account of its earlier maturity.

6. Results of Mung Bean Yield Trials

Uniform regional tests for mung bean were conducted in the Philippines, Thailand and Malaysia. Unfortunately, the data which were submitted by Malaysia were misplaced during the trip of the delegates to Baguio and, therefore, cannot be reported this year. The experiments were conducted at the UPCA in the Philippines and Srisamrong Station at the upper central plain in Thailand.

The experiments were grown in 4-row plots, 6 meters long. A completely randomized block design with four replications was used. Plant population was at 300,000 plants per hectare and fertilizer was applied at 20 kg N, 45 kg P_2O_5, and 45 kg K_2O per hectare.

The results are presented in Table 6.

The three highest yielders in the Philippines were two Philippine-bred lines, CES 87 and CES 14, and one entry from Vietnam, Dau Mo Long Khanh. Maturity period of the three varieties was at 62 to 64 days which was 4 to 6 days later than the earliest maturing variety from the Philippines, MG-50-10A.

Table 6. Yield, crude protein and other agronomic characteristics of mung bean varieties in the Philippines and Thailand

Variety	Varietal Origin	Yield			Crude Protein	Days to Flowering	Maturity		Plant Height	
		Philippines	Thailand	Average			Philippines	Thailand	Philippines	Thailand
		Tons/ha			Percent	Days	Days		cm	
1. CES-28	Philippines	1.22	1.53	1.374	21.38	42	63	69	84.37	75.2
2. CES-87	Philippines	1.33	1.24	1.285	21.34	39	62	69	77.09	70.0
3. CES-14	Philippines	1.29	1.26	1.274	21.79	43	64	70	86.82	79.0
4. Indian No. 1 3/	Thailand	-	1.15	1.150	-	-	-	67	-	63.2
5. Day Mo Longkhanh	Vietnam	1.31	0.89	1.102	21.50	41	62	69	80.52	73.2
6. MG 55-3 3/	Thailand	-	1.08	1.080	-	-	-	69	-	72.5
7. MG-50-10A 1/	Philippines	1.05	-	1.050	22.42	37	58	-	60.92	-
8. Bhacti	Indonesia	1.09	0.94	1.013	21.26	39	59	68	64.80	66.5
9. Day Moc Longkhanh	Vietnam	1.06 4/	0.85	0.955	21.96	51	77	73	107.06	81.3
10. Glossy Seed 2/	Thailand	-	0.95	0.950	-	-	-	70	-	83.5
11. Siwlic	Indonesia	1.06 4/	0.79	0.923	23.82	50	77	77	104.51	89.5
12. Local No. 2 2/	Thailand	-	0.85	0.850	-	-	-	77	-	70.2
CV		10.56	24.65							
LSD .01		0.18	-							
.05		0.25	-							

1/ - Local check in the Philippines
2/ - Local check in Thailand
3/ - Introduced varieties included in the test in Thailand
4/ - Supported with stakes and strings to prevent lodging

In Thailand, the three highest yielding varieties were CES 28, CES 14 and CES 87, all Philippine-bred lines, with yields of 1.53, 1.26 and 1.25 tons per hectare, respectively, as compared with 0.85 ton of the local variety. The yield at 1.53 tons per hectare is considered very high for mungo. Maturity of the three varieties was at 69 tc 70 days, which was comparatively early.

V. Plans for the Year and Future Outlook

There are seven groups of high-protein crops to be grown uniformly in seven countries. The idea is to grow each crop species during the season of the year at most favorable and economically advantageous conditions for the particular crop in each country, Table 7. With this system, the work schedule will be distributed within the year and avoid heavy work loads at any one time.

The work plans indicate that each group of crops will be grown only once a year in one location in each country. If the program goes into full gear this year, 1972-73, in which each country will be able to conduct all the trials, by the end of 1973-74, two plantings for each group would have been completed in each country. The results from two croppings would be sufficient to form a basis for deciding which entries

Table 7. Planting dates of SEARCA trials by country

	COUNTRIES					
	Philippines	Indonesia	Thailand	Malaysia	Khmer Republic	Laos
Corn	Oct.-Nov.	Oct.-Nov.	July-Aug.	March-April	Oct.-Nov.	April, May & Oct.
Soybean						
a) Late group	Oct.-Nov.	April-May	May-June	"	August	"
b) Early group	May-June					
c) Vegetable type	May-June					
Mungo	May-June	"	May-June July*, Jan.	"	March-April Nov.-Dec.	April, May, June, Oct.
Peanut	Oct.-Nov.	"	May-June January	"	May-June	"
Sweet Potato	May-June	All months	May-June March-April	"	All months	All months
Cowpea	-	April-May	July-Oct. March-April	"	Nov.-Dec. March-April	May, June, Oct., Nov.

a) Snap bean group	May-June
b) Dry bean group	Oct.-Nov.

*Preferable dates

have to be dropped from the program in favor of new and upcoming varieties developed from the breeding programs of the different countries. In this connection, the plan is to schedule the second biennial meeting at the latter part of 1973-74 for the purpose of reviewing the program.

During the intervening periods, 1972 to 1974, two members of the team from UPCA will regularly visit the experiments in the different countries. The two members of the team will go on separate designated visits to follow up and see all the experiments at least once a year. Attempts will be made to assist countries in establishing their own national program for systematic regional varietal testing, and seed certification and distribution that is similar to those existing and operating in the Philippines, Thailand and Indonesia. This is important if the results of these cooperative trials are to be integrated into national programs and make the necessary impact.

Hopefully, at the end of 1973-74, varieties of the different high-protein crops which performed well in two-year trials in each country shall have been identified for channeling into the national programs.

In the case of Vietnam, Laos and the Khmer Republic seeds of different legumes and other crop species have been imported from time to time in relatively large quantities for trial commercial plantings without the benefit of prior supportive experimental evaluation. The results of the present cooperative experiments in these countries will serve a useful purpose in deciding which variety in each crop to import seeds for. If only for this, the intent of the present program shall have been partially fulfilled and justified.

The program covering the period from 1972-73 to 1973-7 will be considered as the first phase, in which the present sets of varietal entries shall have been fully evaluated. The second phase, from 1974-75 to 1975-76 will constitute new sets of entries coming from the different country breeding programs. Hopefully, these new sets of varieties shall have marked improvements over the old sets in terms of greater resistance to diseases, higher seed yield potential, standability of the crop and earliness. The manner in which the second phase will be carried out will be similar to that of the first phase, with the third biennial meeting scheduled in 1975-76.

To ascertain that the results of the regional and national trials are conveyed to the farm level in terms of reliable seed supply, a study will be undertaken to determine the potential seed needs for high protein crops in Southeast Asia. Coupled with this is a study on the feasibility of establishing a seed business, taking into consideration the essential economic factors that will insure its success. These studies are thought of in view of the timidity of the private sector in participating and engaging in the seed business anywhere in Southeast Asia. The results of such studies will be useful in launching a promotional campaign to motivate the private sector in going into the seed business.

VI. Expenditures in 1971-72

Expenditures this fiscal year are summarized in Table 8.

VII. Budgetary Requirements for 1972 to 1976

The budgetary requirements of the project for 1972 to 1976 appear in Table 9.

The budgetary requirements for the survey of seed needs and feasibility studies on the establishment of a viable system of seed supply and distribution in Southeast Asia are indicated in Table 10.

Table 8. Summary of expenditures of Southeast Asian project on high-protein crops, 1971-72

Item	Budgetary Allocation	
	SEARCA	NFAC
I. Los Baños		
Research assistant	₱4,620	
Analyst	4,620	
Casual laborers	6,112	₱3,500
Supplies	6,500	4,500
Travel	500	1,000
Contingency	3,600	
Sundry	1,200	500
Sub-total	27,152	9,500
II. Other Locations (Budget per location)		
Casual labor	1,500	
Supplies	1,500	
Sundry	1,000	
Sub-total	4,000	
III. Meeting of participants to UPCA		
Travel expenses of twelve participants	22,145	
Per diem	8,440	
Miscellaneous expenses	1,340	
Sub-total	31,925	
GRAND TOTAL	₱63,077	₱9,500

Table 9. Budgetary requirements of Southeast Asian project on high-protein crops, 1972-76

Item	Fiscal Year			
	1972-73	1973-74	1974-75	1975-76
I. Personnel Services				
One research instructor	₱6,900	₱6,900	₱7,320	₱7,320
One analyst	6,900	6,900	7,320	7,320
Casual labor	9,000	9,630	10,200	10,900
Sub-total	22,800	23,430	24,840	25,540
II. Maintenance and Operating Expenses				
Supplies	8,250	8,830	9,450	10,110
Travel	11,000	11,770	12,590	13,480
Contingency	12,000	12,000	12,000	12,000
Sundry (air freight and miscellaneous expenses)	1,200	1,290	1,380	1,470
Sub-total	32,450	33,890	35,420	37,060
III. Support to Outside Locations (5)[1]				
Labor	5,000	5,350	5,730	6,130
Supply	7,500	8,020	8,590	9,190
Sundry	4,250	4,550	4,870	5,210
Sub-total	16,750	17,920	19,190	20,530
IV. Biennial Meeting[2]				
Travel	-	21,440	-	24,550
Per Diem	-	16,060	-	18,430
Miscellaneous Expenses	-	3,350	-	3,840
Sub-total	-	40,850	-	46,820
GRAND TOTAL	₱72,000	₱116,090	₱ 79,450	₱129,950
	$10,590	$17,070	$11,680	$19,110

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[1] Indonesia, Thailand, Laos, Khmer Republic and South Vietnam. Malaysia does not need support.

[2] Biennial Meetings to be held in Indonesia and in Thailand in 1974 and 1976, respectively.

Table 10. Budgetary requirements: Survey of seed needs and feasibility studies on the establishment of a viable system of seed supply and distribution in Southeast Asia

Item	Fiscal Year	
	1974-75	1975-76
Lumpsum Appropriation	$15,000	$15,000